



Total Maximum Daily Load Information Sheet

Dark Creek

Waterbody Segment at a Glance:

County: Randolph
Nearby Cities: Clifton Hill and Huntsville
Length of impairment: 8 miles
Pollutant: Sulfate
Source: Crutchfield Abandoned Mine Land (AML)



State map showing location of watershed

TMDL Priority Ranking: TMDL Approved 2004

Description of the Problem

Beneficial uses of Dark Creek

- Livestock and Wildlife Watering
- Protection of Warm Water Aquatic Life
- Protection of Human Health associated with Fish Consumption

Use that is impaired

- Protection of Warm Water Aquatic Life

Standards that apply

- Sulfate and chloride are linked together in Missouri's Water Quality Standards (WQS). Section (4)(L)1 states that the concentration of chloride plus sulfate in streams with a 7Q10 low flow of less than one (1) cubic foot per second shall not exceed 1,000 milligrams per liter (mg/L or parts per million) for protection of aquatic life.

Background Information and Water Quality Data

In the past, approximately 1700 acres of land were strip mined for coal near Darksville, in Randolph County, and were later abandoned. This area is called the Crutchfield Abandoned Mine Land (AML). This AML drains into Dark Creek. Sulfide minerals, commonly found in coal and surrounding rock, oxidize when exposed to the air and are subsequently dissolved by surface flows and groundwater. This weathering process results in large amounts of sulfate in surface runoff and shallow groundwaters being discharged to Dark Creek. Freshwater aquatic life cannot tolerate large amounts of dissolved substances in water. The table below shows the results of fifteen water quality surveys of four locations on Dark Creek completed by the Department of Natural Resources from 2000 through 2004. The rate of exceedence of the 1,000 mg/L standard ranges from 56

percent at site 1 to 12.5 percent at site 4. Any exceedence rate of the sulfate plus chloride standard greater than 10 percent is considered to be causing water quality impairment.

Data for Dark Creek, Randolph County, Missouri (2000-2004)

(Key to abbreviations may be found below the table)

Site #	Site Name	Year	Mo	Day	pH	SO4	Cl	SO4+Cl	PE
1	Dark Creek 0.1 mile below Crutchfield AML	2000	3	17	7.5	855	41	896	
1	Dark Creek 0.1 mile below Crutchfield AML	2000	4	24	7	1710	15	1725	
1	Dark Creek 0.1 mile below Crutchfield AML	2000	8	18	8	1360	19	1379	
1	Dark Creek 0.1 mile below Crutchfield AML	2001	3	6	6.8	566	17	583	
1	Dark Creek 0.1 mile below Crutchfield AML	2001	6	14	7	747	17	764	
1	Dark Creek 0.1 mile below Crutchfield AML	2001	9	4	7.2	1190	14	1204	
1	Dark Creek 0.1 mile below Crutchfield AML	2001	10	25	7.7	1240	17	1257	
1	Dark Creek 0.1 mile below Crutchfield AML	2001	12	20	7.2	1220	23	1243	
1	Dark Creek 0.1 mile below Crutchfield AML	2002	1	10	6.8	2130	14	2144	
1	Dark Creek 0.1 mile below Crutchfield AML	2002	3	18	6.8	664	19	683	
1	Dark Creek 0.1 mile below Crutchfield AML	2002	6	28	7.6	738	20	758	
1	Dark Creek 0.1 mile below Crutchfield AML	2002	9	25	7.6	2270	15	2285	
1	Dark Creek 0.1 mile below Crutchfield AML	2002	12	10	7.8	2400	13	2413	
1	Dark Creek 0.1 mile below Crutchfield AML	2003	3	12	7.9	1710	14	1724	
1	Dark Creek 0.1 mile below Crutchfield AML	2004	3	4	7	580	28	608	
1	Dark Creek 0.1 mile below Crutchfield AML	2004	5	28	7.2	96	16	112	
	Mean					1217	19	1236	56%
2	Dark Creek 3 miles below Crutchfield AML	2000	3	17	7.4	618	28	646	
2	Dark Creek 3 miles below Crutchfield AML	2000	4	24	7.7	1550	13	1563	
2	Dark Creek 3 miles below Crutchfield AML	2000	8	18	7.8	245	14	259	
2	Dark Creek 3 miles below Crutchfield AML	2001	3	6	7.6	465	15	480	
2	Dark Creek 3 miles below Crutchfield AML	2001	7	14	7.6	384	14	398	
2	Dark Creek 3 miles below Crutchfield AML	2001	9	4	7.6	449	21	470	
2	Dark Creek 3 miles below Crutchfield AML	2001	10	25	7.8	529	16	545	
2	Dark Creek 3 miles below Crutchfield AML	2001	12	20	7.8	879	18	897	
2	Dark Creek 3 miles below Crutchfield AML	2002	1	10	7.3	1460	15	1475	
2	Dark Creek 3 miles below Crutchfield AML	2002	3	18	7.6	541	15	556	
2	Dark Creek 3 miles below Crutchfield AML	2002	6	28	7.8	866	12	878	
2	Dark Creek 3 miles below Crutchfield AML	2002	9	25	7.8	511	29	540	
2	Dark Creek 3 miles below Crutchfield AML	2002	12	10	7.6	2600	20	2620	
2	Dark Creek 3 miles below Crutchfield AML	2003	3	12	8	1320	15	1335	
2	Dark Creek 3 miles below Crutchfield AML	2004	3	4	7.6	544	20	564	
2	Dark Creek 3 miles below Crutchfield AML	2004	5	28	7.5	100	10	110	
	Mean					816	17	833.5	25%
3	Dark Creek 6 miles below Crutchfield AML	2000	3	17	7.2	1120	14	1134	
3	Dark Creek 6 miles below Crutchfield AML	2000	4	24	7.5	1110	15	1125	
3	Dark Creek 6 miles below Crutchfield AML	2000	8	18	8	306	10	316	
3	Dark Creek 6 miles below Crutchfield AML	2001	3	6	7.7	360	12	372	
3	Dark Creek 6 miles below Crutchfield AML	2001	7	14	7.5	299	14	313	
3	Dark Creek 6 miles below Crutchfield AML	2001	9	4	7.5	740	12	752	
3	Dark Creek 6 miles below Crutchfield AML	2001	10	25	7.8	352	11	363	
3	Dark Creek 6 miles below Crutchfield AML	2001	12	20	7.8	856	15	871	
3	Dark Creek 6 miles below Crutchfield AML	2002	1	10	7.4	917	18	935	
3	Dark Creek 6 miles below Crutchfield AML	2002	3	12	8.1	1110	13	1123	
3	Dark Creek 6 miles below Crutchfield AML	2002	3	18	8	488	13	501	
3	Dark Creek 6 miles below Crutchfield AML	2002	6	28	7.9	580	10	590	
3	Dark Creek 6 miles below Crutchfield AML	2002	9	25	7.6	316	10	326	

3	Dark Creek 6 miles below Crutchfield AML	2002	12	10	7.5	1060	15	1075	
3	Dark Creek 6 miles below Crutchfield AML	2004	3	4	7.6	509	17	526	
3	Dark Creek 6 miles below Crutchfield AML	2004	5	28	7.3	143	9	152	
	Mean					642	13	654.6	25%
4	Dark Creek 8 miles below Crutchfield AML	2000	3	17	7.6	1130	10	1140	
4	Dark Creek 8 miles below Crutchfield AML	2000	4	24	7.5	1020	16	1036	
4	Dark Creek 8 miles below Crutchfield AML	2000	8	18	8	242	10	252	
4	Dark Creek 8 miles below Crutchfield AML	2001	3	6	7.4	298	13	311	
4	Dark Creek 8 miles below Crutchfield AML	2001	7	14	7.2	274	15	289	
4	Dark Creek 8 miles below Crutchfield AML	2001	9	4	7.4	411	10	421	
4	Dark Creek 8 miles below Crutchfield AML	2001	10	25	7.4	283	16	299	
4	Dark Creek 8 miles below Crutchfield AML	2001	12	20	7.8	721	15	736	
4	Dark Creek 8 miles below Crutchfield AML	2002	1	10	7.3	959	20	979	
4	Dark Creek 8 miles below Crutchfield AML	2002	3	12	8.1	893	14	907	
4	Dark Creek 8 miles below Crutchfield AML	2002	3	18	7.8	425	14	439	
4	Dark Creek 8 miles below Crutchfield AML	2002	6	28	7.5	445	11	456	
4	Dark Creek 8 miles below Crutchfield AML	2002	9	25	7.8	748	29	777	
4	Dark Creek 8 miles below Crutchfield AML	2002	12	10	7.4	841	16	857	
4	Dark Creek 8 miles below Crutchfield AML	2004	3	4	7.5	429	20	449	
4	Dark Creek 8 miles below Crutchfield AML	2004	5	28	7.3	109	9	118	
	Mean					517	15	519.6	12.5%

Source: Missouri Department of Natural Resources

AML = Abandoned Mine Land; SO₄ = Sulfate in mg/L; Cl = Chloride in mg/L

pH =The measurement of acidity or alkalinity. A pH of 7 Standard Units is neutral; 1-6 is acidic; 8-14 is basic or alkaline.

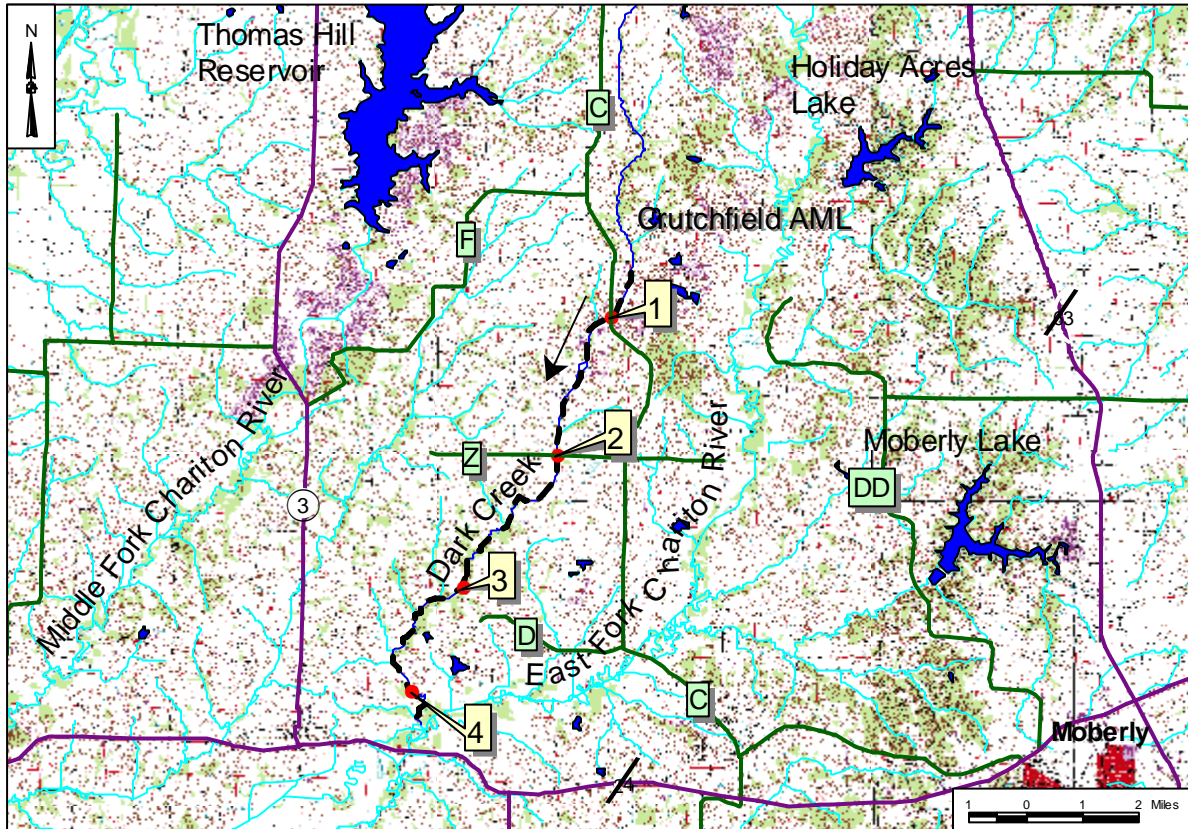
PE = Percent Exceedence, (eg At the site 0.1 mile below the AML site, water quality standards for sulfate and chloride are exceeded 64 percent of the time.)

In 1990, at a cost of \$1,213,004, the department's Land Reclamation Program conducted a reclamation project on the coal waste areas in the Crutchfield AML totaling 162 acres. This project was accomplished mainly by re-contouring the surface of the land, eliminating acid ponds, burying acid-forming spoils and establishing permanent vegetation. The project has remedied the worst of the problems. What remains to be done is to reduce the amount of sulfate and chloride materials being exposed to air and water through soil erosion. Every time soil is removed through erosion on these surface mined lands, new sulfate and chloride materials are exposed to air and water which increases the amount of sulfate-rich runoff that enters Dark Creek.

The way to control the Acid Soil Erosion of previously mined land is to install good farming practices. There is a current Agricultural Nonpoint Source (AgNPS) Special Land Area Treatment (SALT) Project for Dark and Sugar Creeks in Randolph County that is able to funnel resources to the Dark Creek watershed. This seven-year project was initiated July 1, 2002 with a budget of \$750,000. There is a steering committee and many educational activities have already taken place. The July 2004 Semi-annual Progress Report shows that overall the project is 11 percent complete. The department has been working with the Randolph County Soil and Water District through educational meetings with the steering committee and other landowners. The meetings discuss how the AgNPS SALT goals to reduce the soil erosion and increase productivity of the land parallel the goals in the Dark Creek TMDL.

The U.S. Environmental Protection Agency approved the TMDL December 15, 2004. A map of the area and a graph of the data may be found below.

Dark Creek in Randolph County, Missouri, Showing Sampling Sites and the Impaired Segment

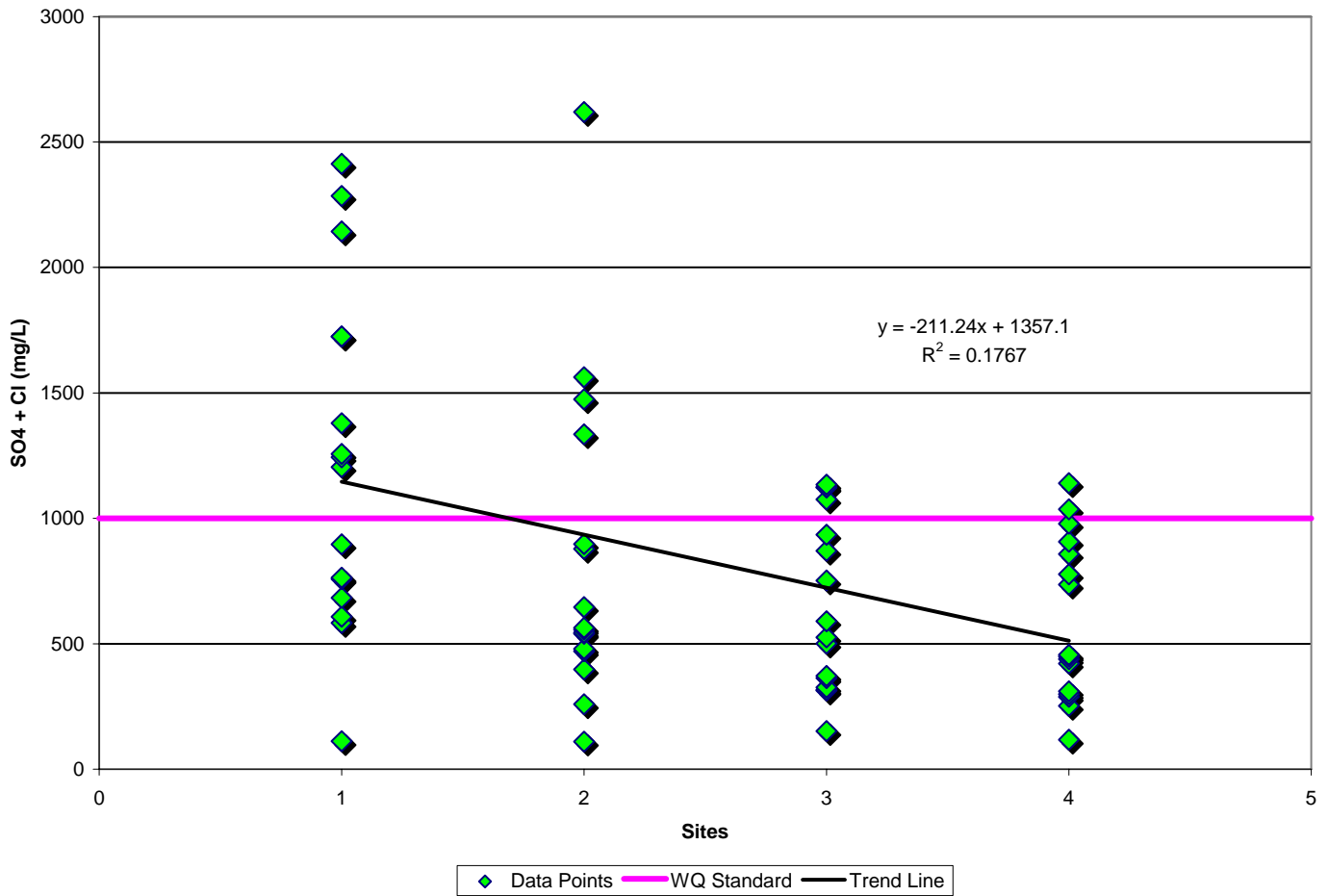


Impaired segment
 Sample site
 Direction of Flow

Site Index

- 1 – Dark Creek 0.1 mile below Crutchfield AML
- 2 – Dark Creek 3 miles below Crutchfield AML
- 3 – Dark Creek 6 miles below Crutchfield AML
- 4 – Dark Creek 8 miles below Crutchfield AML

Sulfate plus Chloride in Dark Creek 2000-2004 with Trend Line



For more information call or write:

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